CHAPTER 16
MISCELLANEOUS LIFTING DEVICES

This chapter provides safety standards designated to sign verify, based on personal observation, certified records, or direct reports, that a specific action has been performed in accordance with specified requirements. for the operation, inspection, testing, and maintenance for miscellaneous lifting devices, (truck mounted cranes - capacity 1 ton or less not covered in ASME B30.5 ("Mobile and Locomotive Cranes") and implements the requirements of ASME PALD ("Portable Automotive Lifting Devices") for self contained shop cranes.

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16.1 GENERAL

This chapter applies to self contained shop cranes (Figure 16-1), and implements the requirements of ASME "Portable Automotive Lifting Devices" (PALD), and small cranes 1 ton or less (Figure 16-2), installed on truck bodies/beds, etc. that are not covered by requirements in ASME B30.5 ("Mobile and Locomotive Cranes").

16.1.1 Operator Training/Qualification

a. Operators of shop cranes shall be familiar with, understand and follow the operating instructions provided by the equipment manufacturer.

b. Operators of small cranes 1 ton or less shall be trained as required in Chapter 6, "Personnel Qualifications and Training."

16.1.2 Rated-Load Markings, Safety Markings and Operating Instructions

a. Safety markings shall be legible and conform to the ANSI Z535.

b. Markings, or decals, etc. must be provided and affixed by the use of durable materials in a location visible to the operator in order to provide a clear understanding of any special warning, capacity information, etc.

c. Shop cranes shall have the rated capacity for each specified boom and leg position marked in a prominent location on the equipment.

d. Small cranes 1 ton or less shall have a durable rating chart with legible letters and figures attached in a location accessible to the operator.

e. Operating instructions developed by the original manufacturer or supplier shall be maintained and made available to the operator. For small cranes 1 ton or less, operating instructions may be maintained on the vehicle on which the crane is installed.

f. Safety instructions for shop cranes should include the following:

1. Study, understand, and follow all instructions before operating this device.

2. Do not exceed rated capacity.

3. Use only on hard level surface.

4. Before moving, lower the load to the lowest possible point.

16.1.3 Modification

a. Miscellaneous lifting devices may be modified or re-rated provided that the modifications of supporting structures are analyzed thoroughly by a qualified engineer or by the manufacturer of the lifting device.

b. A re-rated lifting device, or one whose load-supporting components have been modified, shall be tested in accordance with Section 16.3, "Testing." The new rated capacity shall be displayed in accordance with Section 16.1.2, "Rated-Load Marking," Safety Markings and Operating Instructions."

16.1.4 Load Limits

Miscellaneous lifting devices shall not be loaded beyond its rated capacity except for test purposes, as described in Section 16.3.

16.1.5 Operating Controls

a. Operating controls shall be readily visible and accessible to the operator and shall not subject the operator to pinch points, sharp edges, or snagging hazards.

b. The release system for shop cranes shall require intentional positive action by the operator for release to prevent accidental lowering.

16.1.6 Load Hook

a. Shop cranes shall be equipped with load hooks and/or chain capable of sustaining the proof load of the crane.

b. Latch-equipped hooks shall be used for all operations unless the application makes using the latch impractical, unnecessary, or unsafe.

The absence of a hook-throat latch is not indiscriminately allowed.

16.1.7 Wire Rope

a. Wire rope, (single line capacity) used on small cranes 1 ton or less shall have a minimum design factor of 3.5:1 based upon breaking strength.

b. Small cranes 1 ton of less shall be equipped with properly sized wire rope sheaves in lieu of flat spools.

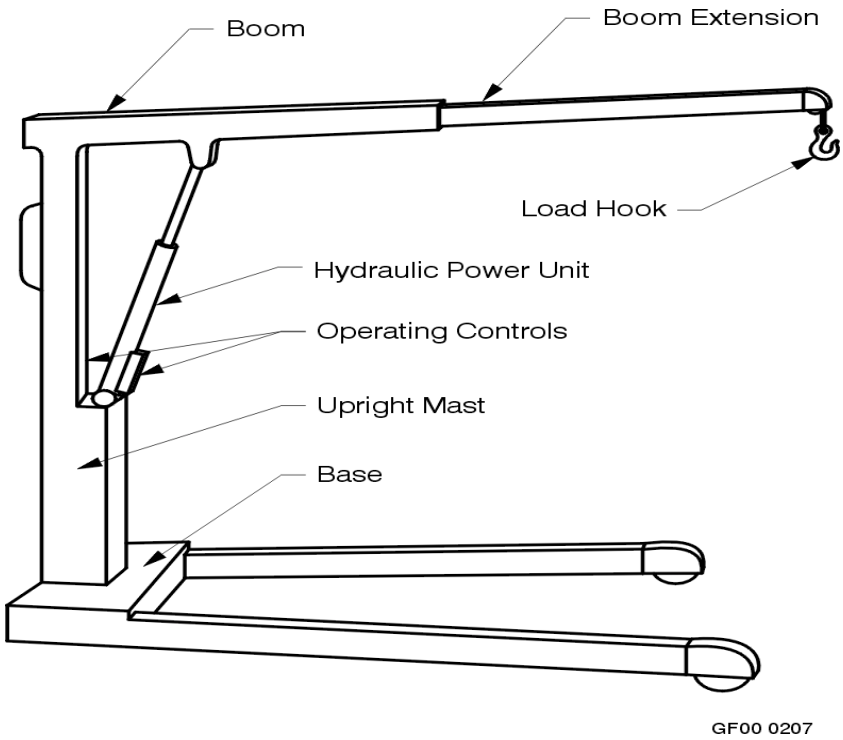

Figure 16-1. Self Contained Shop Crane.

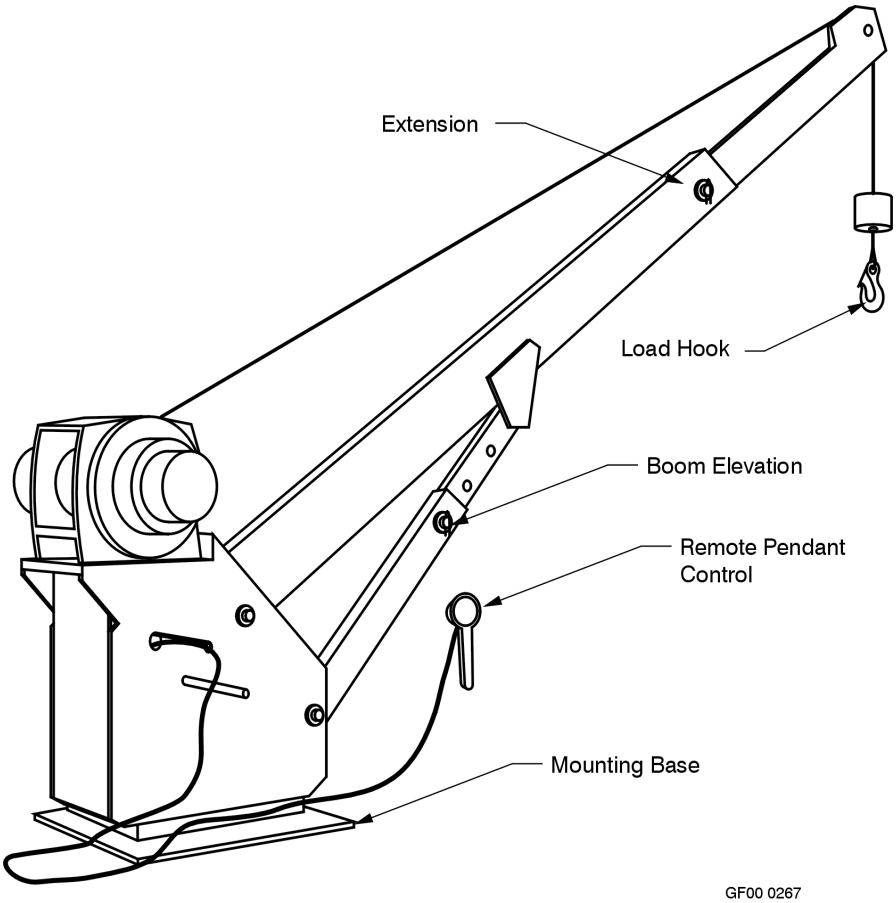

Figure 16-2. Truck Mounted Crane - Capacity 1 Ton or Less.

16.2 INSPECTIONS

16.2.1 General

Equipment shall operate with a smooth, regular motion without any hesitation, abnormal vibration, binding, or irregularity. There shall be no apparent damage, excessive wear, or deformation of any load-bearing part of the equipment. All safety devices, controls, and other operating parts of the equipment shall be checked during each inspection and shall be in good working order.

16.2.2 Initial Inspection

Prior to initial use, all new or modified miscellaneous lifting equipment shall be inspected as required in Section 16.2.4, "Periodic Inspection," by a qualified inspector to ensure compliance with the applicable provisions of this chapter. Dated and signed inspection reports shall be kept on file and shall be readily available.

16.2.3 Daily Preoperational Check

a. Operators or other designated personnel shall visually inspect miscellaneous lifting equipment each day or prior to use if the equipment has not been in regular service (records are not required). The inspection shall include, but not be limited to inspecting the following:

1. All control mechanisms for maladjustment interfering with proper operation.

2. Hook and latch for deformation, cracks, and wear.

3. Hydraulic systems for proper operation.

4. Wire rope for kinking, crushing, birdcaging, and corrosion.

5. Chain for bent links, stretched links, cracks, scores, abrasions or heat damage.

6. All safety devices for malfunction.

7. Inspection items identified in manufacturer's operating instructions.

b. Operators or other designated personnel shall examine deficiencies and determine whether they constitute a safety hazard.

16.2.4 Periodic Inspection

a. Complete inspections of the miscellaneous lifting equipment shall be performed by a qualified inspector at 1- to 12-month intervals, depending on the lifting equipment's activity, severity of service, and environment or as recommended by the equipment manufacturer.

b. The qualified inspector shall examine deficiencies and determine whether they constitute a hazard.

c. Dated and signed inspection records shall be kept on file and shall be readily available.

16.3 TESTING

16.3.1 Operational Tests

The load lifting and lowering mechanisms shall be tested during an initial test:

16.3.2 Rated Load Test

a. Prior to initial use, all new small cranes 1 ton or less and small cranes 1 ton or less in which load-sustaining parts have been modified, replaced, or repaired shall be load-tested by a qualified inspector or under the direction of that inspector.

b. A written report shall be furnished by the inspector showing test procedures and confirming the adequacy of repairs or alterations. Test reports shall be kept on file and shall be readily available to appointed personnel.

c. Test loads shall not be less than 100 percent of the rated capacity, unless otherwise recommended by the manufacturer or a qualified person.

d. Shop cranes built to design specifications are proof-tested by the manufacturer in accordance with ASME PALD, "Portable Automotive Lifting Devices," Part 12. After repair or modification, a qualified engineer shall determine if testing is required.

16.4 MAINTENANCE

a. A preventive maintenance program based on the manufacturer's recommendations should be established. Dated records should be made available.

b. Replacement parts shall be at least equal to the original manufacturer's specifications.

16.5 OPERATION

16.5.1 Conduct of Operator

a. Before operating, the operator shall have an understanding of the lifting device's operating safety instructions.

b. The operator shall not:

1. Engage in any practice that will divert their attention while operating miscellaneous lifting devices.

2. Operate the lifting device beyond its rated capacity (except for rated load tests).

3. Operate miscellaneous lifting devices when physically or mentally unfit.

c. The operator shall:

1. Before moving the load, lower the load to the lowest possible point.

2. Only operate shop cranes on hard, level surfaces capable of sustaining the load.

3. Ensure the load does not drop suddenly or swing during transportation.

4. Whenever there is doubt as to safety, consult with the responsible management before operating miscellaneous lifting devices.

5. If adjustment or repairs are necessary, or any other defects are known, report the potential problem promptly to responsible management.

d. If necessary to leave a shop crane with a suspended load unattended, the immediate area (about 30 inches) around the shop crane should be posted or barricaded to restrict entry of unauthorized personnel.

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CHAPTER 17 REFERENCES

American Institute of Steel Construction

AISC Specifications for the design, fabrication, and erection of structural steel for buildings.

American Iron and Steel Institute

AISI Standards for Type-302 or Type-304 stainless steel.

American National Standards Institute and American Society of Mechanical Engineers

ANSI A10.28, Work Platforms Suspended From Cranes or Derricks.

ANSI A10.18, Floor and Wall Openings, Railings and Toe Boards.

ASME B30.2, Overhead and Gantry Cranes (Top-Running Bridge, Single or Multiple Girder, Top-Running Trolley Hoist).

ASME B30.5, Mobile and Locomotive Cranes.

ASME B30.6, Derricks.

ASME B30.7, Base-Mounted Drum Hoists.

ASME B30.9, Slings.

ASME B30.10, Hooks.

ASME B30.11, Monorail Systems and Underhung Cranes.

ASME B30.12, Handling Loads Suspended from Rotorcraft.

ASME B30.14, Side Boom Tractors.

ASME B30.16, Overhead Hoists (Underhung).

ASME B30.17, Overhead and Gantry Cranes (Top Running Bridge, Single Girder, Underhung Hoist).

ASME B30.20, Below-The-Hook Lifting Devices.

ASME B30.21, Manually Lever Operated Hoists.

ASME B30.22, Articulating Boom Cranes.

ASME B30.23, Personnel Lifting Systems

ASME B56.1 Safety Standard for Powered Industrial Trucks—Low Lift and High Lift Trucks.

ASME B56.5, Guided Industrial Vehicles.

ASME B56.6, Rough Terrain Fork Lift Trucks.

ASME B56.7, Industrial Crane Trucks. Special Notice 6-88

ASME B56.11.4, Forks and Fork Carriers for Powered Industrial Fork Lift Trucks, Hook Type.

ASME PALD, Portable Automotive Lifting Devices.

ANSI/ASTM Specification A391, Specification for Alloy Steel Chain.

ANSI/ASTM Specification E-165, Standard Practice for Liquid Penetrant Inspection Method.

ANSI/ASTM Specification E-709, Standard Practice for Magnetic Particle Examination.

ANSI/AWS D14.1, Specification for Welding of Industrial and Mill Cranes and Other Material Handling Equipment.

ASME HST-1M, Performance Standard for Electric Chain Hoists.

ASME HST-2M, Performance Standard for Hand Chain Manually Operated Chain Hoists.

ANSI/ASME HST-3M, Performance Standard for Manually Lever Operated Chain Hoists.

ANSI/ASME HST-4M, Performance Standard for Electric Wire Rope Hoists.

ANSI/ASME HST-5M, Performance Standard for Air Chain Hoists.

ANSI/ASME HST-6M, Performance Standard for Air Wire Rope Hoists.

ANSI MH 27.1, Specifications for Underhung Cranes and Monorail Systems.

ANSI N14.6, Standard for Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 kg) or More for Nuclear Materials.

ASME NQA-1, Quality Assurance Program Requirements for Nuclear Facilities.

ASME Cranes for Nuclear Facilities:

ASME NUM-1 Rules for Construction of Cranes, Monorails, and Hoists (With Bridge or Trolley or Hoist of the Underhung Type)

ASME NOG-1 Rule for Construction of Overhead and Gantry Cranes (Toprunning Bridge, Multiple Gider)

American Society for Nondestructive Testing

Recommended Practice No. ASNT-TC-1A.

American Welding Society

ANSI/AWS D1.1 Structural Welding Code—Steel.

Crane Manufacturers' Association of America

CMAA No. 70, Specification for Electric Overhead Traveling Cranes.

CMAA No. 74, Specification for Top Running and Under Running, Single Girder, Electric Overhead Traveling Cranes.

Department of Energy

DOE 440.1A, Worker Protection Management for Federal and Contractor Employees

DOE 440.1-6, Suspect Counterfeit Items Guide

Department of Labor

29 CFR 1910, Occupational Safety and Health Standards for General Industry.

29 CFR 1926, Occupational Safety and Health Regulations for Construction.

Department of Transportation

49 CFR 391.41, Physical Qualification for Drivers.

National Fire Protection Association

ANSI/NFPA 505, Powered Industrial Trucks, Type Designation and Areas of Use.

NFPA 70, National Electrical Code.

Power Crane and Shovel Association

PCSA-4, Mobile Power Crane and Excavator Standards and Hydraulic Crane Standards.

Society of Automotive Engineers

SAE J376-85, Load-Indicating Devices in Lifting Crane Service.

Code.SAE J765, Crane Load Stability Test

SAE J874, Center of Gravity Test Code.

SAE J987, Crane Structure, Method of Test.

Underwriters' Laboratories

UL 558, Internal-Combustion-Engine-Powered Industrial Trucks.

UL 583, Electric-Battery-Powered Industrial Trucks.

APPENDIX A
PROCUREMENT GUIDELINES

This appendix provides reference guidance in preparing purchase requisitions for hoisting and rigging materials and equipment. Nationally recognized standards and specifications are referenced for listed items. However, caution should be used prior to procurement of special items in order to verify appropriate specification or standard reference and requirements. Some specific requirements listed in this appendix are more restrictive than consensus standard requirements, but are recommended to ensure materials of adequate quality and workmanship are provided.

Quality receipt inspections should be provided for all received materials in order to verify compliance of all requirements stated on the purchase order.

This appendix primarily contains procurement criteria for off-the-shelf type items. If the information provided in this appendix is used in the development of specifications for purchase of cranes or other special handling equipment, the appropriate engineering group should be consulted.

Since this appendix contains only a partial listing of commonly used rigging hardware, the requisitioner shall review applicable standards or specifications and identify requirements to which the manufacturer shall adhere.

More specific information or requirements may be obtained by consulting the applicable section of this standard or an equipment manufacturer.

The manufacturer shall provide requested documentation as appropriate (e.g., rated load certification, proof-load test certification, material certification). The documentation shall be signed by the manufacturer's authorized representative.

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1.1 MANUAL, ELECTRIC AND AIR OPERATED HOISTS

a. Suggested requirements include but are not limited to the following:

1. Manual, electric and air operated hoists shall meet or exceed the requirements of ASME/ANSI B30.16.

2. The rated load shall be marked on the hoist or load block.

3. Shall be marked with identification as follows:

A) Hand Chain Operated
1) Name of manufacturer
2) Manufacturer's model or serial number

B) Electric-Powered Hoist
1) Name of manufacturer
2) Manufacturer's model or serial number
3) Voltage of AC or DC power supply and phase and frequency of AC power supply.
4) Circuit ampacity

C) Air Powered Hoist
1) Name of manufacturer
2) Manufacturer's model and serial number
3) Rated air pressure

b. All manual, electric, or air operated hoists shall have affixed to the hoist or load block a label or labels displaying precautionary information concerning operating procedures

c. Load sprockets shall have teeth or pockets to allow engagement of the load chain, shall be guarded, and provisions shall be made to guard against jamming of the load chain within the hoist mechanism under normal operating conditions.

d. Manufacturer shall supply instruction manual for each hoist, the manual shall include the following information and instructions:

1. Installation
2. Operation
3. Inspection and Testing
4. Lubrication, maintenance, and repair
5. Wiring diagram (electric powered only; maybe supplied separately)

1.1.1 Load Chain

a. Load chain may be either roller or welded link chain.

b. Load chain shall be pitched so as to pass over all load sprockets without binding.

c. Load chain shall be proof tested by the chain or hoist manufacturer with a load test of 150 percent of the rated load divided by the number of chain parts supporting the load.

1.1.2 Hoist Hooks

If hooks are of the swiveling type, they should rotate freely. Hooks shall be equipped with latches unless the application makes the use of the latch impractical. When required, a latch shall be provided to bridge the throat opening of the hook and retain, under slack conditions such items as, but not limited to slings, chains, etc. Refer to ASME/ANSI B 30.10.

1.1.3 Load Blocks

a. On hand chain operated hoists, a means shall be provided to guard against load chain jamming in the load block under normal operating conditions.

b. On electric- or air-powered hoists, load blocks shall be of the enclosed type, and means shall be be provided to guard against rope or load chain jamming in the load block under normal operating conditions.

1.1.4 Hoist Brakes

a. Hand chain operated hoist(s) shall be so designed that, when the actuating force is removed, it will automatically stop and hold any test load up to 125 percent of the rated load.

b. Electric-powered hoist, under normal operating conditions with rated load and test conditions with test loads up to 125 percent of rated load, the braking system shall perform the following functions:

1. stop and hold the load hook when controls are released;

2. limit the speed of load during lowering, with or without power, to a maximum speed of

120 percent of rated of rated lowering speed for the load being handled;

3. stop and hold the load hook in the event of a complete power failure.

c. The braking system shall have thermal capacity for the frequency of operation required by the service.

d. The braking system shall have provision for adjustments where necessary to compensate for wear.

e. Air-powered hoist, under normal operating conditions with rated load and test conditions with test loads up to 125 percent of rated load, the braking system shall perform the following functions:

1. Stop and hold the load hook when controls are released;

2. prevent an uncontrolled lowering of the load in the event of a loss of air pressure

3. The braking system shall have thermal capacity for the frequency of operation required by the service.

4. The braking system shall have provision for adjustments where necessary to compensate for wear.

2.1 MANUALLY OPERATED LEVER HOIST

a. Suggested requirements include but are not limited to the following:

1. Manually operated lever hoists shall meet or exceed the requirements of ASME/ANSI B30.21.

2. Shall have the rated load marked on the hoist or load block

3. Shall be tested by the manufacturer with a test load of at least 125 percent of the rated load

4. Shall have identifications for controls to indicate function or direction of motion.

5. Shall be marked with identification as follows

A) Name of Manufacturer

B) Manufacturer's model or serial number

6. Shall have affixed to the hoist or load block in a readable position, a label or labels displaying precautionary information concerning operating procedures.

2.1.1 Construction

Load sprockets shall have pockets or teeth to allow engagement of the load chain, shall be guarded, and provisions shall be made to guard against jamming of the load chain with the hoist mechanism under normal operating conditions.

2.1.2 Load Chain

a. Load chain may be either roller or welded link type and shall be pitched so as to pass over all sprockets without binding.

b. Load chain shall be proof tested by the chain or hoist manufacturer with a load test of 150 percent of the hoist rated load divided by the number of chain parts supporting the load.

c. If a load is supported by more than one part of load chain, the tension on the parts shall be equalized.

2.1.3 Load Blocks

Shall have means to guard against load chain jamming in the load block under normal operating conditions.

2.1.4 Load Controlling Mechanism

a. Shall be equipped with a load controlling mechanism, which shall perform the following functions under normal operating conditions with test loads up to 125 percent of the rated load.

1. Stop and hold the load when the lever force is removed and the lever stroke completed.

2. Provide for incidental movement of the load when lifting or lowering.

3. Friction brake shall have provision for adjustment where necessary to compensate for wear

a. Manufacturer shall supply instruction manual for each hoist, the manual shall include the following information and instructions:

1. Operation
2. Inspection and Testing
3. Lubrication, maintenance, and repair

3.1 SHOP/FLOOR CRANES

a. Suggested requirements include but are not limited to the following:

1. Shall meet or exceed the requirements of ASME PALD.

2. Operating controls shall be designed in such a manner that they are readily visible and accessible to the operator and so that the operator will not be subjected to pinch points, sharp edges, or snagging hazards. The operation of controls should be clear to the operator either by position, function, labeling or combination thereof.

3. The release system shall require intentional positive action by the operator for release to prevent accidental lowering.

4. Shall have a positive means to prevent the load from being lowered or raised beyond the design limit of travel.

5. Shop/floor cranes not equipped with internal load limit devices shall be capable of performing a proof test of 150 percent of the rated capacity.

6. Shop cranes equipped with internal load limiting devices shall, when the load limiting device is deactivated, be capable of performing a proof load test of 125 percent of rated capacity.

7. Because of the potential hazards associated with the misuse of equipment of this type, no alterations shall be made to the product.

8. Shop/floor cranes shall be provided with a load hook and/or chain at the end of the boom extension, that has a capacity capable of sustaining the proof load of the unit. The load hook shall be provided with a latching mechanism.

9. Shall have required product warnings and markings

4.1 BELOW THE HOOK STRUCTURAL AND MECHANICAL LIFTING DEVICES

a. Suggested requirements include but are not limited to the following:

1. Shall conform to requirements of ASME/ANSI B30.20.

NOTE: Special lifting devices for shipping containers weighing 10,000 lbs or more that are used for radioactive materials maybe governed by ANSI N14.6 (Standard for Shipping Containers Weighing 10,000 Pounds or More for Nuclear Materials).

2. Shall have the rated load capacity marked on the main structure where it is visible. If the lifter is made up of several lifters, each detachable from the group, these lifters shall also be marked with their individual rated loads.

3. A load test, not to exceed 125 percent of the rated load unless otherwise recommended by a manufacturer shall be provided.

4. A load test cetificate indicating the date of load test, amount of load applied, and confirmation of lifter load rating shall be supplied.

5. Rated load should not be more than 80 percent of the maximum load sustained during the test.

6. Shall have a complete or other permanent marking affixed to the lifter displaying the following:

A) Manufacturer's Name
B) Serial Number/Identification Number
C) Lifter Weight if over 100 lbs. (45KG)
D) Rated load Capacity

4.1.1 General Construction

a. Shall be designed to withstand the forces imposed by the rated load.

b. Shall have a minimum design factor of 3 based on yield strength for all load bearing structural components.

c. Welding shall be in accordance with ANSI/AWS D1.

d. Guards for exposed moving parts such as, but not limited to gearing, projecting shafts, and chain drives that constitute a hazard under normal operating conditions should be guarded.

e. Electrical equipment and wiring shall com ply with Article 610 of ANSI/NFPA 70.

5.1 WIRE ROPE

a. Suggested requirements include but are not limited to the following:

b. Wire rope shall meet or exceed the requirements of Federal Specification, RR-W-410 for wire rope, Mil Specification MIL-DTL-83420 for air craft cable and MIL-W-83140 for non-rotating stainless steel wire rope.

c. Wire rope shall be made in the United States by a member of the Wire Rope Technical Board[1] (except stainless steel, and unless recommended otherwise by a crane or hoist manufacturer). Stainless steel wire rope shall be made in the United States and shall be 302 or 304 grade stainless steel unless otherwise recommended by a crane or hoist manufacturer.

d. Wire rope shall have documentation from the manufacturer traceable to the material furnished and signed by the manufacturer's authorized representative. Documentation should reference as a minimum the purchase order number, the diameter, number of strands, core, lay, grade, manufacturer's lot/run number, material number and the nominal breaking strength of a sample.

e. Shall be shipped lubricated and with a protective covering, i.e. plastic or cardboard.

[1]Union Wire Rope, The Rochester Company, Williamsport Wire Rope, Macwhyte Company, Paulsen Wire Rope Corporation, Wire Rope Corp. Of America, Broderick & Bascom Rope Co., Bridon American Corporation.
Note: This list is not all inclusive and may not include subsidiary companies

6.1 CHAIN SLINGS

a. Suggested requirements include but are not limited to the following:

1. Shall meet or exceed requirements of ASME/ANSI B30.9 and 29 CFR 1910.184.

2. Alloy steel chain slings shall have permanently affixed durable identification stating size, manufacturer's grade, rated load and angle upon which the rating is based, reach, number of legs, and sling manufacturer.

3. Hooks, rings, oblong links, pear-shaped links, welded or mechanical coupling links or other attachments shall have a rated load of at least equal to that of alloy steel chain with which they are used.

4. All welded components in the sling assembly shall be proof load tested as components or as part of the sling assembly.

5. Hooks attached to chain slings shall meet the requirements of ASME/ANSI B30.10.

6. The welded components of all new slings shall be proof tested by the component or sling manufacturer to 200 percent of the rated load.

7. The proof load for multiple leg slings shall be applied to the individual legs and shall be 200 percent of the rated load of a single leg sling.

8. A certificate of proof test shall be provided by the manufacturer or supplier referencing the specific sling identification number, date of test, and amount of load applied. (Employer shall retain a certificate of the proof test and shall make it available for examination.)

7.1 SYNTHETIC SLINGS

a. Suggested requirements include but are not limited to the following:

1. Shall meet or exceed the requirements of 29 CFR 1910.184 and ASME/ANSI B30.9.

2. Should be manufactured from webbing specifically constructed for overhead lifting, featuring red core yarns.

3. Webbing shall have the following characteristics:

A) sufficient certified tensile strength to meet the sling manufacturer's requirements;

B) uniform thickness and width;

C) full woven width, including selvage edges;

D) webbing ends shall be sealed by heat, or other suitable means, to prevent raveling.

4. Thread used in the manufacture of synthetic web slings shall be the same generic type yarn as the sling webbing.

5. Stitches shall be lock-stitched and preferably continuous. When not continuous, it shall be back stitched at the ends to prevent raveling.

6. The load carrying splice shall be sewn with a pattern of sufficient strength to justify the manufacturer's rated capacities.

7. Shall have a minimum design factor of 5.

8. End fittings shall have sufficient strength to sustain twice the rated load of the sling without permanent deformation.

9. EACH SLING SHALL BE PERMANENTLY MARKED WITH THE FOLLOWING:

A) Manufacturer's name or trademark.

B) Manufacturer's code or stock number.

C) Type of synthetic web material.

D) Rated loads for the type of hitches used.

NOTE: Hand written, or ink embossed markings are not acceptable. Sling tags shall be indelibly marked and the lettering shall not wear off with use. The markings shall remain legible for the life of the sling.

10. The manufacturer shall have on file a written system of sling traceability as well as a quality control procedure. Traceability should be specific mill lots.

11. Fabric wear pads should be sewn into the bearing points of the sling eye's. Leather wear pads are not recommended.

12. Product warnings relative to the proper use, care, and maintenance shall accompany the shipment.

13. Single leg and endless synthetic-web slings shall be proof tested to 200 percent of the rated load.

14. Multiple leg bridle slings shall have the proof load applied to the individual legs. The proof load shall be two times the vertical rated load of a single leg sling.

15. A load test certificate (LTC) shall be provided for each lot of slings supplied. The LTC shall reference as a minimum the PO number, date of proof test, amount of load applied, sling capacity, and lot/run number. The LTC shall be signed by the manufacturers authorized representative.

NOTE: Sling lengths shall be within a specified tolerance. Synthetic sling manufacturers normal length is ±1percent of the sling length. If closer tolerance is required the purchaser should specifically request required tolerance on the purchase order.

8.1 SYNTHETIC POLYESTER ROUND SLINGS

a. Suggested requirements include but are not limited to the following:

1. Slings should meet or exceed requirements of the Web Sling and Tiedown Association, In., recommended specification for roundslings made of poleyster fibers used for general lifting purposes.

2. Polyester roundslings including those incorporating welded fittings shall be proof tested to 200 percent of the vertical rated capacity.

3. A load test certificate (LTC) shall be provided for each lot of slings supplied. The LTC shall reference a a minimum the PO number, date of proof test, amount of load applied, sling capacity and lot/run number. The LTC shall be signed by the manufacturers authorized representative.

4. The core(s) shall be formed from one or more ends of yarn, wound together on a plurality of turns. The core(s) should be uniformly wound to ensure even distribution of the load.

5. The cover(s) should be of the same fiber type as the load bearing core(s). When the cover is a different fiber type than the load bearing core, follow the manufacturer's recommendations for use.

6. The cover should be made from one length of material.

7. When the core and cover are of the same fiber, the thread shall also be of that fiber type. When the core and cover are of different fiber types, the thread should be of the same fiber type as the cover.

8. All stitching shall be lock-stitched type and should be continuous. When not continuous, they shall be back stitched or overstitched to prevent raveling.

9. The design factor for new polyester roundslings and polyester roundslings incorporating fittings shall be a minimum of five (5).

10. Each polyester roundsling shall be permanently marked or labeled showing:

A) Name or trademark of manufacturer.
B) Manufacturer's code or stock number.
C) Rated capacities for the three basic hitches. (vertical, choker, vertical basket)
D) Core fiber type - if cover(s) is of a different fiber type, both fiber types shall be identified.
E) Length (reach) - bearing point to bearing point.

11. Each manufacturer shall internally identify their product with name or trademark for traceability.

9.1 WIRE ROPE SLINGS

a. Suggested requirements include but are not limited to the following:

1. Shall meet or exceed the requirements of 29 CFR 1910.184 and ASME/ANSI B30.9.

2. Wire rope purchased to fabricate slings shall be made in the United States by a member of Wire Rope Technical Board (Except stainless steel). Stainless steel wire rope shall be made in the United States and shall be 302 or 304 Grade stainless steel.

3. Wire rope shall meet the requirements of Federal Specification RR-W-410D or Military Specification MIL-W-83420.

4. Wire rope shall have documentation from the manufacturer traceable to the material furnished and signed by the manufacturer's authorized representative. Documentation shall reference as a minimum the PO number, the diameter, number of strands, core, lay, grade, manufacturing lot/run number, master reel number and nominal breaking strength of sample.

5. Shall be shipped lubricated and with a protective covering, i.e. plastic or cardboard.

6. Slings should be either 6 x 19 or 6 x 37 classification.

7. Slings should be made of wire rope produced from EXIPS (Extra Improved Plow Steel) with an IWRC (Independent Wire Rope Center). Consideration may be given to other grades or types of wire rope, dependent upon the type of expected service due to the type of load, hitch, or environment.

8. Shall have a minimum of 5 to 1 safety factor.

9. Mechanical spliced single leg and endless wire rope slings,and swaged socket or poured socket assemblies shall be load tested to 200 percent of the rated vertical load.

10. Shall be individually tagged with a durable tag including the following information:

A) WLL (Working Load Limit)
B) Purchase order number or serial number
C) Manufacturer's name or ID

11. Shall have a load test certificate (LTC) for each lot of slings supplied. The LTC shall reference as a minimum the PO number, date of proof test, amount of load applied, sling capacity, & lot/run number, LTC shall be signed by the manufacturer's authorized representative.

12. Single leg hand tucked slings shall have a proof load equal to the rated load but shall not exceed 125 percent of the rated load.

13. The proof load for multiple leg bridle slings shall be applied to the individual legs and shall be either 125 percent for hand tucked splice or 200 percent for mechanical splice, times the vertical rated load of a single leg sling of the same size, grade, and construction of rope. Any master link to which multiple leg slings are connected shall be proof loaded to 200 percent of the force applied by the combined legs

14. Multiple leg bridle slings shall be tagged with a durable tag on the master link indicating the working load limit for the total combined legs for each individual sling in a vertical configuration. The purchase order number or serial number and the manufacturer’s ID should be supplied.

10.1 WIRE ROPE CLIPS (Clamps)

a. Suggested requirements include but are not limited to the following:

1. Shall meet or exceed requirements of Federal Specification FF-C-450D.

2. Shall be permanently and legibly marked with the size and manufacturer's identifying mark.

3. Wire rope clips should be shipped with application instructions and product warnings for each type or size clip.

11.1 EYE BOLTS

a. Suggested requirements include but are not limited to the following:

1. Shall be fabricated from forged carbon or alloy steel and shall meet or exceed the requirements of ASTM specification A489 for "Carbon Steel Eye Bolts" or ASTM F541 "Standard Specification for Alloy Steel Eyebolts." and ANSI/ASME B18.15 "Forged Eye Bolts".

2. Eye bolts used for lifting service shall have the manufacturer's name or identification mark forged in raised characters on the surface of the eyebolt. Alloy steel eye bolts shall have the symbol "A" (denoting alloy) and the manufacturer's name or identification forged in raised letters on the surface of the eyebolt.

3. The safe working load shall have a safety factor of 5.

12.1 HOOKS

a. Suggested requirements include but are not limited to the following:

1. Hooks used for lifting service shall meet or exceed the requirements of ANSI/ASME B30.10.

2. Manufacturer's identification shall be forged cast, or die stamped on a low stress non wearing area of the hook.

3. When proof tests are used to verify manufacturing process, material, or configuration, hooks shall be able to withstand proof load application, without permanent deformation when a load is applied for a minimum of 15 seconds. Proof loads for hooks up to 50 ton capacity shall be 200 percent of the rated capacity.

4. Performance testing of hooks shall not be required except where necessary to conform to requirements for the equipment of which they are a part of.

13.1 SWIVEL HOIST RINGS

a. Suggested requirements include but are not limited to the following:

1. All hoist rings shall be individually proof load tested to a minimum of 200 percent of the rated capacity, but no more than 250 percent of the rated capacity..

2. Shall have a proof load certificate supplied from the manufacturer with each swivel hoist ring.

3. Shall have the manufacturer's name or trademark permanently marked on the swivel hoist ring.

4.

5. Shall have a minimum safety factor of 4 based on ultimate breaking strength.

6. Shall be permanently marked by the manufacturer with the WLL and recommended torque value.

7. Shall be packaged with proper application instructions and warning information.

14.1 HOIST RINGS, PEAR SHAPED LINKS

a. Suggested requirements include but are not limited to the following:

1. Shall meet or exceed the requirements of RR-C-271-D.

2. Welded rings or links shall be subjected to a nondestructive weld test (NDT) and have documentation provided.Note: NDT is not required for forged rings or links.

3. Shall have a minimum safety factor of 5 based on ultimate breaking strength.

4. Rings shall be forged or welded from low alloy steel.

5. Should be marked by the manufacturer with the manufacturer's name or trademark and ring or link size.

15.1 SHACKLES

a. Suggested requirements include but are not limited to the following:

1. Shackles shall meet or exceed the requirements of Federal Specification RR-C-271D.

2. Type of shackles covered by this specification include: Class 1, Round Pin Anchor; Class 2, Screw Pin Anchor; Class 3, Safety Anchor; Class 1, Round Pin Chain; Class 2, Screw Pin Chain; and Class 3, Safety Chain shackles.

3. Each shackle body shall be permanently and legibly marked in raised or stamped letters on the side of the shackle bow with the identifying manufacturer's name or trademark, shackle size, and the recommended safe working load.

A) Grade A regular strength shackle pins and bolts shall be unmarked;

B) Grade B high strength shackle pins and bolts shall be marked by the raised or stamped letters "HS" on the head.

C) Shackle markings shall be raised or stamped letters of the maximum height permitted by the size of the shackle component being marked.

4. Grade A shackles (Regular Strength), together with their pins and bolts shall be forged from carbon steel. Grade B shackles (High Strength) together with their pins and bolts shall be forged from alloy steel.

5. Shackles shall have minimum 5 to 1 safety factor.

6. Shackle samples shall be subjected to proof loads of 200 percent of the rated capacity.

7. Shackle pins shall fit freely without binding and seat properly.

8. Shackles shall be sufficiently ductile so that, when fractured, the fractured member shall show a permanent distortion before breaking.

16.1 TURNBUCKLES - Type III Rigging

a. Suggested requirements include but are not limited to the following:

1. Turnbuckles used for rigging applications shall meet or exceed the requirements of Federal Specification FF-T-791B, Section 3.9.3.

2. Shall be fabricated from forged alloy steel.

3. Shall be provided with a jam nut of a type which does not depend upon deformation of the threads for security.

4. Certificate of proof test shall be provided by the manufacturer for selected samples from each lot. Certificate shall indicate as a minimum the size, WLL, test weight, and date of test.

5. Proof test loads shall be one-half the specified breaking strength for the end pull.

6. Turnbuckles shall have a minimum safety factor of 5 based on ultimate breaking strength.

7. Manufacturer's name or trademark and turnbuckle size shall be permanently marked on the body of the turnbuckle.

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PURCHASE REQUISITION **EXAMPLE ONLY**

PART I - Delivery, Receipt, and Handling (Complete for all Procurements)

P.O. No. AB81111	P.O. Date	Requisition Date 12/18/96
Required Delivery 3/97	Deliver To (Name/Phone No., Bldg. Rm) Myra T. Fail / 1-1111 / Bldg. 501	
Inspection (Check One) ☐ N/A ☒ RI ☐ SI/RI ☐ PDT/RI ☐ RO		
End Use/Project No. Tank Removal	End User (Name/Phone) Myra T. Fail / 1-1111	
Packing, Shipping Level (Check One) ☐ N/A ☐ A ☐ B ☐ C ☐ D ☒ SS	Storage Level ☐ N/A ☐ A ☐ B ☒ C ☐ D	

PART II - Engineering/QA Control Data (Complete for all Procurements)

Type Item ☐ N/A ☐ Engineered ☒ Commercial	Documents Deliverable ☐ None ☐ Comm. ☐ Eng ☒ Quality	On Site Visit Required ☐ Yes ☒ No

PART III - Health and Safety Data (Complete for all Procurements)

Functional Classification ☐ GS

PART IV - Description (Complete for all Procurements)

Procurement Type ☐ ASSI Item ☒ Approved Equal (AE) ☐ ADP ☐ Service ☐ ASSI Item ☐ Sole Source I ☐ Sole Source II

Item No.	Quantity	Unit	Description (Salient Features)	Unit Price	Total Price
1	100	FT	Wire Rope, 1/2" Carbon Steel, 6 x 19 classification EIPS		
			(Extra Improved Rlow Steel), IWRC (Independent Wire Rope Core),		
			RRL (Right Regular Lay)	1.00	100.00
2	10	EA	Wire Rope Slings, 1/2 x 6 ft., made with carbon Steel wire rope,		
			minimum Working Load Limit (4,000 lbs.)	10.00	100.00
3	10	EA	Synthetic Slings, 6 ft. length, Flat Eye and Eye with a minimum		
			rated vertical capacity of 6,000 lbs.	20.00	200.00
4	10	EA	Shackles, screw pin anchor, 25 Ton capacity	40.00	400.00
			SEE CONTINUATION SHEET FOR FUNCTIONAL REQUIREMENTS		
				TOTAL	

Suggested Supplier (Name/Phone No.) Marvin's Rigging Supply Anytown, USA 800-999-0000	Total Est Cost/Price $ 800.00
	Budget Ceiling $1,000.00

APPROVALS:

Approver	Printed Name	Signature	Social Security No.	Phone No.	Date
☒ Requestor	Freddie Hartzop		222-22-2222	1-1112	12/18/96
☐ Safety					
☒ Manager	Joe Boss		220-02-0000	1-1114	12/19/96
☐ Engineering					
☐ Other					

GA99 0027

Exhibit 1- Purchase Requisition Example.

CONTINUATION - PURCHASE REQUISITION **EXAMPLE ONLY**

Item No.	Quantity	Unit	Description (Salient Features)	Unit Price	Total Price
			FUNCTIONAL REQUIREMENTS FOR WIRE ROPE:		
			Carbon steel wire rope shall be made in the United States by a		
			member of the Wire Rope Technical Board.		
			Shall meet the requirements of RR-W-410D Federal Specification		
			for Wire Rope and Strand or MIL-W-83420 for aircraft cable.		
			Shall be shipped lubricated and with a protective covering, i.e.		
			plastic or cardboard.		
			Wire Rope shall have Documentation from the manufacturer		
			traceable to the material furnished and signed by the manufacturer's		
			authorized representative. Documentation Shall reference as a		
			minimum the PURCHASE ORDER number, state the diameter		
			number of strands, core, lay, grade, manufacturing lot/run number		
			or master reel number and nominal breaking strength of sample.		
			Acceptance Criteria:		
			Quality receipt inspection shall verify that the manufacturer is a		
			member of the Wire Rope Technical Board (for carbon steel), verify		
			the diameter, lay, grade, core and documentation as complete and		
			meets or exceeds the requirements of this scope.		
			FUNCTIONAL REQUIREMENTS FOR WIRE ROPE SLINGS:		
			Wire rope purchased to fabricate slings shall be made in the United		
			States by a member of the Wire Rope Technical Board.		
			Shall meet the requirements of RR-W-410D Federal Specification		
			for Wire Rope and Strand or MIL-W-83420 for aircraft cable.		
			Wire Rope Shall have Documentation from the manufacturer		
			traceable to the material furnished and signed by the manufacturer's		
			authorized representative. Documentation Shall reference as a		
			minimum the P.O. number, state the diameter, number of strands,		
			core, lay, grade, manufacturing lot/run number, master reel number,		
			and nominal breaking strength of sample.		
			Shall be shipped lubricated and with a protective covering, i.e.		
			plastic or cardboard.		
			Shall be mechanical flemish eye spliced.		
			Single leg slings Shall be either 6 x 19 or 6 x 37 classification.		

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Exhibit 1 - Purchase Requisition Example (continued)

CONCLUDING MATERIAL

Review Activity:

DOE	Field Offices
DP	CH
EH	ID
EM	NV
RW	OR
ER	RL
EE	SR
FE	AL
	OAK

National Laboratories

BNL

INEEL

LANL

ORNL

SNL

Area Offices

Amarillo Area Office

Princeton Area Office

Rocky Flats Area Office

Western Area Power Association

Preparing Activity:

DOE-EH-53

Project Number:

SAFT-0077

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